



# Hands-on Differential Geometry

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## Field of Research

There are three issues, this doctoral project will investigate.

### Beliefs concerning mathematics

*school:* calculational-algorithmic, uncreative picture of mathematics

*university:* definitions and proofs highly important; axiomatic approach

But where is creativity?

→ What do maths education students think about mathematics? Do these beliefs change when they attend a certain seminar?

### Links between school and university mathematics

Maths education students often miss links between school and university mathematics. That is demotivating and frustrating.

→ How to help students to find some links? What links do they already see?

### Links between the contents of the basic maths lectures

Many students struggle when they try to solve problems that need notions or techniques from both basic maths lectures.

→ How to help students to internalize connections? What connections can students describe explicitly?

## Seminar “Elementary Hands-on Differential Geometry”

The seminar is a regular seminar, lasting one semester, but it is tailored for doing research on the question above.

students have to develop mathematics themselves

use of hands-on material and groupwork

→ support a more vivid and creative picture of mathematics

direct links with regard to content “the same” as topics from school on a higher level

→ useful background knowledge and deeper understanding of school topics

Differential geometry needs both basic lectures to great extent, e.g. differentials and vector spaces.

→ students have to link both topics to develop some differential geometry by themselves

## Design

The research comprises **quantitative and qualitative** parts. There will be a **questionnaire** which the students complete at the beginning and at the end of the semester (quantitative) and the participants of the seminar will write some **texts** that will be analysed with QCA (qualitative).

*only quantitative*

items taken from COACTIV [Literatur!](#)

*quantitative:* little exercises in the questionnaire that need knowledge from both basic lectures to solve them

*qualitative:* The students have to write texts, e.g. explain the connections between the basic lectures to a first year student.

*quantitative:* closed items on importance of contents of different lectures; open item on links between school and university mathematics

*qualitative:* The students have to write texts, e.g. explain curvature of curves to a pupil in the last grade.

## Zeitplan.....

[mehr Quellenangaben!](#)